

WHAT IS CLAIMED IS:

1. A method for fabricating a semiconductor device, comprising:

the step of forming on a first semiconductor layer of aluminum gallium nitride a protection film having an opening and containing silicon, and

5 the step of heat-treating the first semiconductor layer in an oxidizing atmosphere whose temperature is adjusted to be within a range of 950 °C or more and 1050 °C or less.

2. The semiconductor device fabrication method of Claim 1, wherein the heat-treatment step further includes the step of oxidizing part of the first semiconductor layer which is located under the opening of the protection film, and the step of diffusing the silicon
10 downwardly from the protection film.

3. The semiconductor device fabrication method of Claim 1, further comprising the step of forming on the first semiconductor layer a second semiconductor layer which is
15 mainly made of gallium nitride, before the protection-film formation step is performed.

4. The semiconductor device fabrication method of Claim 1, wherein the protection-film formation step further includes the step of forming on the first semiconductor layer a silicon-supplying layer which contains silicon, and the step of forming an oxidation protection
20 layer on the silicon-supplying layer.

5. The semiconductor device fabrication method of Claim 4, wherein in the silicon-supplying-layer formation step, the silicon-supplying layer is formed on a part of an active region of the first semiconductor layer other than a part of the active region on which a gate
25 will be formed, and

in the oxidation-protection-layer formation step, the oxidation protection layer is formed over the active region of the first semiconductor layer so as to cover the silicon-supplying layer.

5 6. The semiconductor device fabrication method of Claim 4, wherein the oxidation protection layer is made of silicon oxide or silicon nitride.

 7. The semiconductor device fabrication method of Claim 4, wherein the oxidation protection layer is a multilayer film in which a silicon oxide film, and a silicon film or a
10 silicon nitride film are stacked in this order.